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V VETERINARY SCIENCE

DOMESTIC animals are among man's most rewarding possessions – so long as they are well. But a cow so sick that she gives no milk is almost valueless, and so too is a lamb so infected with parasitic worms that it gains no weight. It is not surprising, therefore, that in most parts of the world where domestic animals are a source of food, or are used to lighten men's work, or are merely companions, their health is well cared for. Animal health, indeed, is a science in its own right. It is the branch of learning known as *veterinary science*, and its practitioners are usually known as *veterinary surgeons* or *veterinarians*.

A short history of veterinary surgery

All the ancient civilisations were to some extent dependent on domestic animals either for food, for assistance in the fields, for clothes, or for transport. In those early days, no doubt, a sick animal would be taken to a man whose work it was to care for domestic animals, and thus, in time, certain individuals became acknowledged experts. The demand for their services was such that in ancient Babylon the fees which they might charge were controlled by a royal decree, while in India special hospitals were built in which they could work. In Egypt animal experts had their methods recorded in papyri and carved in stone.

In Greece animal experts were known as *hippiatroi*, a word which means 'horse-doctor'. In the later years of Greek civilisation these men carried their skills to Rome where they were engaged to attend the pack animals which carried the supplies for the Roman legions. The Romans called them *veterinarii*, a word which means 'pertaining to beasts of burden', and from which the English language has obtained the word 'veterinary'.

During the Middle Ages the practice of veterinary science fell to a low level. Nobody was much interested in animal health, and the work of treating sick animals became part of the practice of farriers – men whose real task was the shoeing of soldiers' horses. Although these men had little learning or skill, they managed to monopolise the art until veterinary science became a recognised branch of learning in the 18th century.

An Egyptian animal expert treating a cow

Scalpel, gags, hobbles, and syringes used in veterinary practice

The sign of a Roman veterinary surgeon. On the left a man is trimming a horse's mane. On the right another is examining a horse's knee

The first school of veterinary science was opened in 1731 at Lyons in France, and the first British school began work in 1761 in London. In 1844 the Royal College of Veterinary Surgeons was founded. From this time onwards the approach to veterinary science became more and more scientific, and, as a result, many discoveries were made which had far-reaching consequences. In 1850 a Frenchman, Casimir Davaine, observed tiny microbes in the blood of animals dying of anthrax, and in 1877 a German, Robert Koch, succeeded in showing that the disease was the result of a microbial invasion. Although it had been suspected for many years that microbes might cause disease in this way, nobody had ever before managed to provide a conclusive proof that this was so.

Anthrax microbes were used some years later by another Frenchman, Louis Pasteur, to make a *vaccine*. This was the first of all the bacterial vaccines which have since been used in veterinary and human medicine.

The successes of the 19th century were followed by many more in the 20th. Several common diseases of animals were found to be caused by microbes or by other parasites – in many cases worms – and in some instances the methods of treatment and prevention were so successful that the diseases were completely eradicated. New drugs, particularly the sulphonamides and the antibiotics, proved their worth, and vaccines were devised which would protect animals from virus and helminth (worm) infections. Finally, advances were made in the formulation of animal foodstuffs, particularly those containing drugs to suppress outbreaks of infectious diseases in poultry.

Previous page: Veterinary surgeons in large veterinary clinics have many modern devices to assist them in their work. Here an X-ray apparatus is being used to obtain a picture of an injured dog's shoulder.

UGANDA, TANGANYIKA, AND ZANZIBAR

Sisal, Tanganyika's principal export, drying on a sisal estate

ON 5th June 1963 President Nyerere of Tanganyika, Mr Obote, Prime Minister of Uganda, and Mr Kenyatta, Prime Minister of Kenya, met in Nairobi. The result was the formation of the East African Federation, consisting of these three countries. Zanzibar was not represented at the conference but was invited to join the Federation as a full member and agreed to unite with Tanganyika in April 1964. The formation of the Federation was followed by the independence of Zanzibar (on 10th December 1963) and of Kenya (on 12th December 1963). Both Tanganyika and Uganda had already achieved independence in December 1961 and October 1962 respectively.

In the space of 100 years the peoples of East Africa have progressed from a group of disunited tribes, almost constantly at war with each other or with invaders from the north, to fully independent members of the British Commonwealth.

UGANDA: PHYSICAL

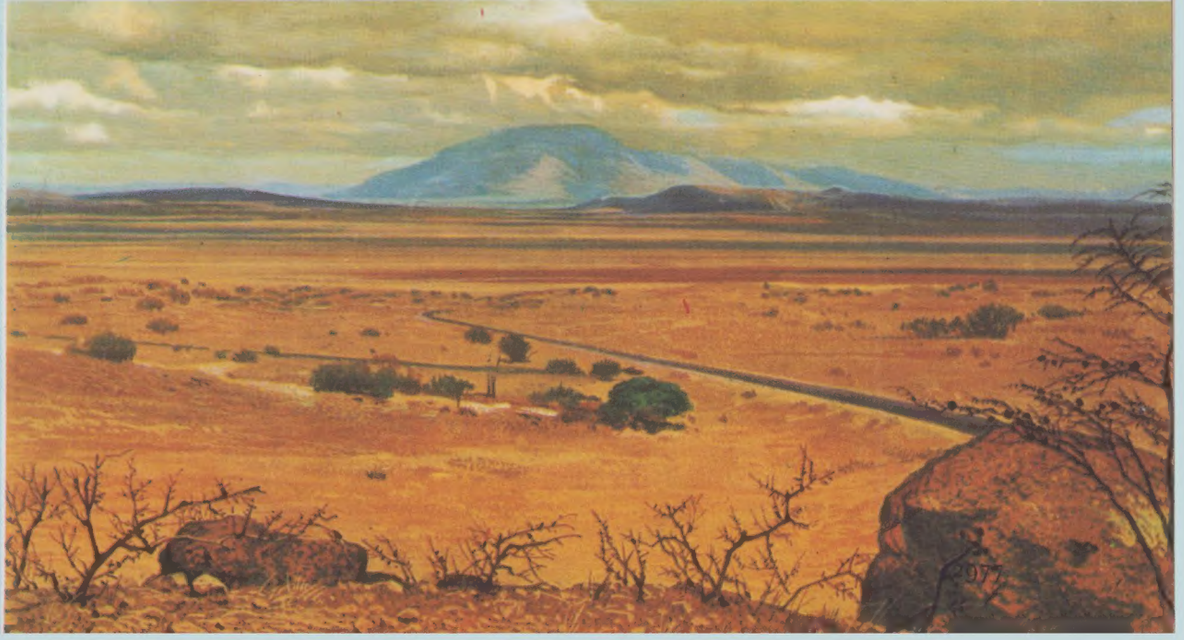
Uganda is part of the great interior plateau of Africa and lies mostly between 3,500 and 4,500 feet above sea level. Of its 94,000 square miles (a little larger than Great Britain) nearly 14,000 square miles are water – part of Lakes Victoria, Edward, and Albert, as well as the whole of Lakes George, Kyoga, and Kwania. The permanent snow-caps and glaciers of the Ruwenzori Mountains, dominated by Mount Stanley (16,795 feet), form a natural boundary with the Congo. The second highest mountain is Mount Elgon (14,178 feet), an extinct volcano on the border with Kenya.

Within its comparatively small area Uganda has some of the great sights of Africa. Its game reserve and the Queen Elizabeth National Park teem with wild life, and the botanical gardens at Entebbe, on the shores of Lake Victoria, are among the finest in the world. The majestic Nile leaves Lake Victoria at Jinja and flows over the Ripon Falls, discovered by John Speke in 1862 but now practically submerged by the rise in water caused by the great Owen Falls dam farther downstream. Beyond Lake Albert the Victoria Nile plunges 400 feet in a series of three cascades in the spectacular Murchison Falls.

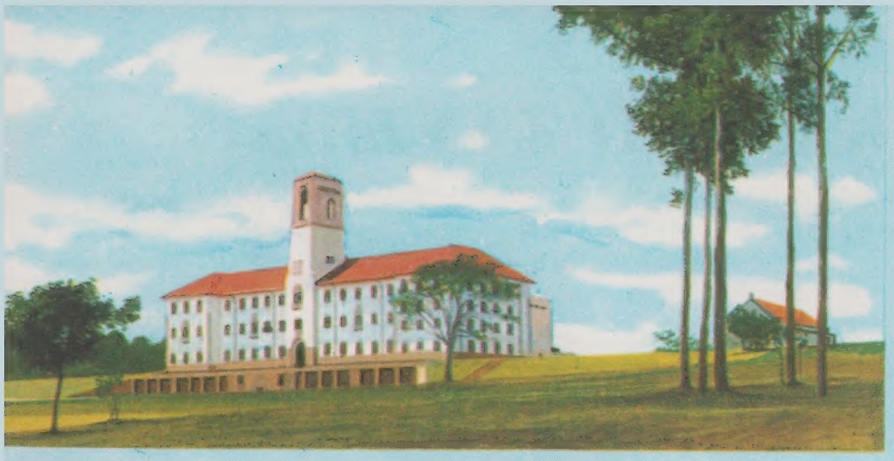
Because of the altitude, Uganda's equatorial climate shows some change between summer and winter, while the nights are considerably cooler than the days. Rainfall varies from between 50 and 90 inches annually near Lake Victoria and in the higher western regions to only 35 inches or less at Karamoja in the northern semi-desert. Elephant grass grows thickly in the wetter areas, where there are also dense tropical forests; sparse savannah vegetation grows in the drier regions.

UGANDA: HISTORY

Since the 15th century Uganda has been invaded by Hamitic peoples, particularly from southern Sudan. Arab slave traders penetrated from the coast in the middle of the 19th century, followed some years later by European explorers and missionaries like Stanley (see page 2157). The principal native kingdom at this time was Buganda, ruled by a *kabaka* or king, who found his subjects' loyalty increasingly divided by the different faiths introduced by the missionaries. In 1890 the Imperial British East African Company signed a treaty with the Kabaka and agreed to keep order in Buganda, but civil and religious wars led to the establishment of a British protectorate in 1894. In the years that followed Uganda's boundaries were set at their present extent, and a civil administration was introduced in which the tribal chiefs or kings played a part. Coffee, cotton, and other industries were established, and roads and rail-



Typical East African scenery in Tanganyika, on the road to Kenya



The University College of Makerere, Uganda

ways were built linking Uganda with her neighbours. The universal rise in the prices of raw materials after the Second World War brought great prosperity to Uganda, and new industries, including tin and copper mines and a sugar refinery, were opened. The Owen Falls dam and hydroelectric scheme, inaugurated by Queen Elizabeth II in 1954, has led to the growth of heavy industries in and around Jinja.

Uganda is now a sovereign independent state. The first President, elected in October 1963, is Sir Edward Mutesa II, the Kabaka of Buganda. The country is administered in four provinces – Eastern, Western, Northern, and Buganda. Toro, Ankole, and Bunyoro are also tribal kingdoms within Uganda, which, like Buganda, have their own parliament or *lukiko* with special local powers.

Map showing geographical position of Uganda, Tanganyika, and Zanzibar

Map of Uganda, Tanganyika, and Zanzibar

The administrative centre and site of Uganda's international airport is Entebbe, a pleasant residential city with a population of 8,000. It is built on a peninsula jutting out into Lake Victoria. Kampala, the capital of Buganda, is also the commercial capital of Uganda and has a population of 12,000. The Kabaka's palace and the tombs of former kings are near the city, which contains Makerere College, founded in 1939, the only university college in East Africa.

Uganda's population is now about 6½ million, of whom roughly 6,437,000 are Africans, 69,000 are Indians, 4,000 are Arabs, and 10,000 are Europeans. English is the official language, but about half the African people (of whom 1 million are Baganda) speak Bantu languages, particularly Luganda. In the wetter areas the population is settled, living on farms or plantations, while the drier regions are inhabited by cattle-owning people who practise a shifting form of intensive agriculture.

TANGANYIKA: PHYSICAL

Except for a coastal plain from 10 to 40 miles wide, Tanganyika is a great plateau about 4,000 feet above sea level, with rolling plains occasionally broken by isolated hills or small mountain ranges. Kilimanjaro (19,565 feet), Africa's highest mountain (see page 2116), rises in the north-east not far from the Ngorongoro Crater, an extinct volcano that forms part of the game reserve which also includes the Serengeti Plains. Here, too, is the Olduvai Gorge, a famous Stone-Age site that has provided valuable information about the beginnings of mankind.

The rivers of Tanganyika flow into three oceans: the Pangani, Rufiji, and Ruvuma into the Indian Ocean; the Kagera and Mara via Lake Victoria into the Mediterranean; and the Malagarasi via Lake Tanganyika into the Atlantic.

TANGANYIKA: GENERAL

The coastal plains have a humid, tropical climate, but inland above 2,000 feet it is dry and hot with extreme daily variations in temperature. The rains last from November to April, followed by near drought from May to October. Valuable timber grows above 5,000 feet, but about a third of the territory is dry savannah, often infested with tsetse fly and either sparsely populated or uninhabited. Tanganyika's 9½ million people (of whom 9,200,000 are African, 22,700 European, and about 90,000 Indian) are concentrated either on the east coast or near Lake Victoria in the west.

The African population is made up of over 100 tribes, mostly Bantu, among some of whom tribal customs and laws are still strictly observed. In many tribes cattle are prized as a form of wealth, as well as for religious reasons. A variety of Bantu dialects are spoken, but Swahili is widely used in education and is the basic language of

UGANDA

Area: 93,981 sq. m. (Lakes: 13,600 sq. m.)
Population: 6,538,175 (1959)
Capital: Kampala (population 12,000)
Roads (all-weather): 3,342 miles
Other roads: 8,300 miles
Exports: coffee, cotton, copper, tin
Other products: tobacco, tea, groundnuts, sugar, sisal, oil seeds, fish, timber.

TANGANYIKA

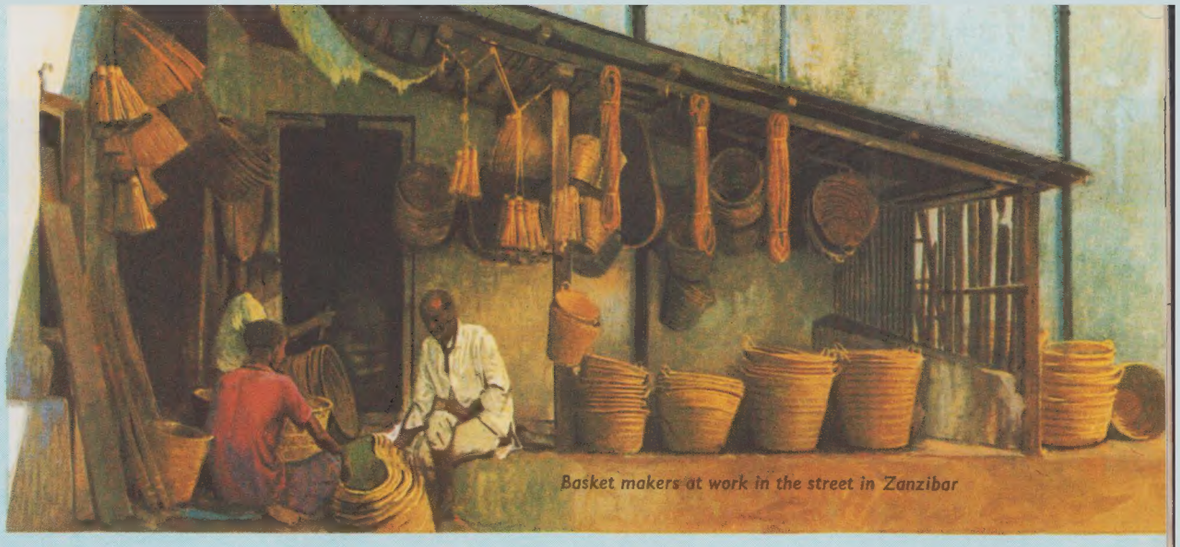
Area: 362,688 sq. m. (Lakes: 20,650 sq. m.)
Coastline: 500 miles
Population: 9,403,700 (est. 1963)
Capital: Dar es Salaam (population 128,742)
Main roads: 9,000 miles
Other roads: 18,800 miles
Exports: sisal, cotton, coffee, nuts, tea, beans, timber, diamonds, gold, lead, salt, oil seeds, meat, hides and skins

ZANZIBAR

Area: 1,020 sq. m. (Zanzibar: 640 sq. m.; Pemba: 380 sq. m.)
Population: 299,111 (Zanzibar: 165,253; Pemba: 133,858)
Capital: Zanzibar (population 57,923)
Roads: about 600 miles
Exports: cloves, copra, coconut oil, coir fibre, tropical fruits, chillies, shells, seaweed, fish, a variety of ivory and ebony ornaments.

the coastal region. The capital and chief port is Dar es Salaam (population 128,732).

Near the coast, where there are tidal mangrove swamps, Arab influence has led to individual ownership of land; but inland the Africans generally practise the same shifting cultivation as in parts of Kenya and Uganda. Tea, coffee, tobacco, pyrethrum, and wheat are produced in the western highlands, while in the north and east much sisal is grown. Rice, maize, cotton, groundnuts, and millet are also grown in the lower, wetter areas.



Basket makers at work in the street in Zanzibar

TANGANYIKA: HISTORY

The coast of Tanganyika came under Portuguese control in the 16th century. In the 17th century the Arab sultans of Oman, who ruled Zanzibar, ousted the Portuguese, and after 1832 the territory came under the nominal rule of the Sultan of Zanzibar. The native population, Bantu and Hamites from the north and Zulus from the south, provided material for the Arab slave trade until the German government established a protectorate in 1891. In 1920 part of German East Africa was assigned to Britain by the League of Nations and named Tanganyika. In 1946 the mandate was converted to a trusteeship agreement under the United Nations; this ended when Tanganyika became fully self-governing in May 1961. On 9th December 1961 Dr Julius Nyerere became the first President of an independent Tanganyika.

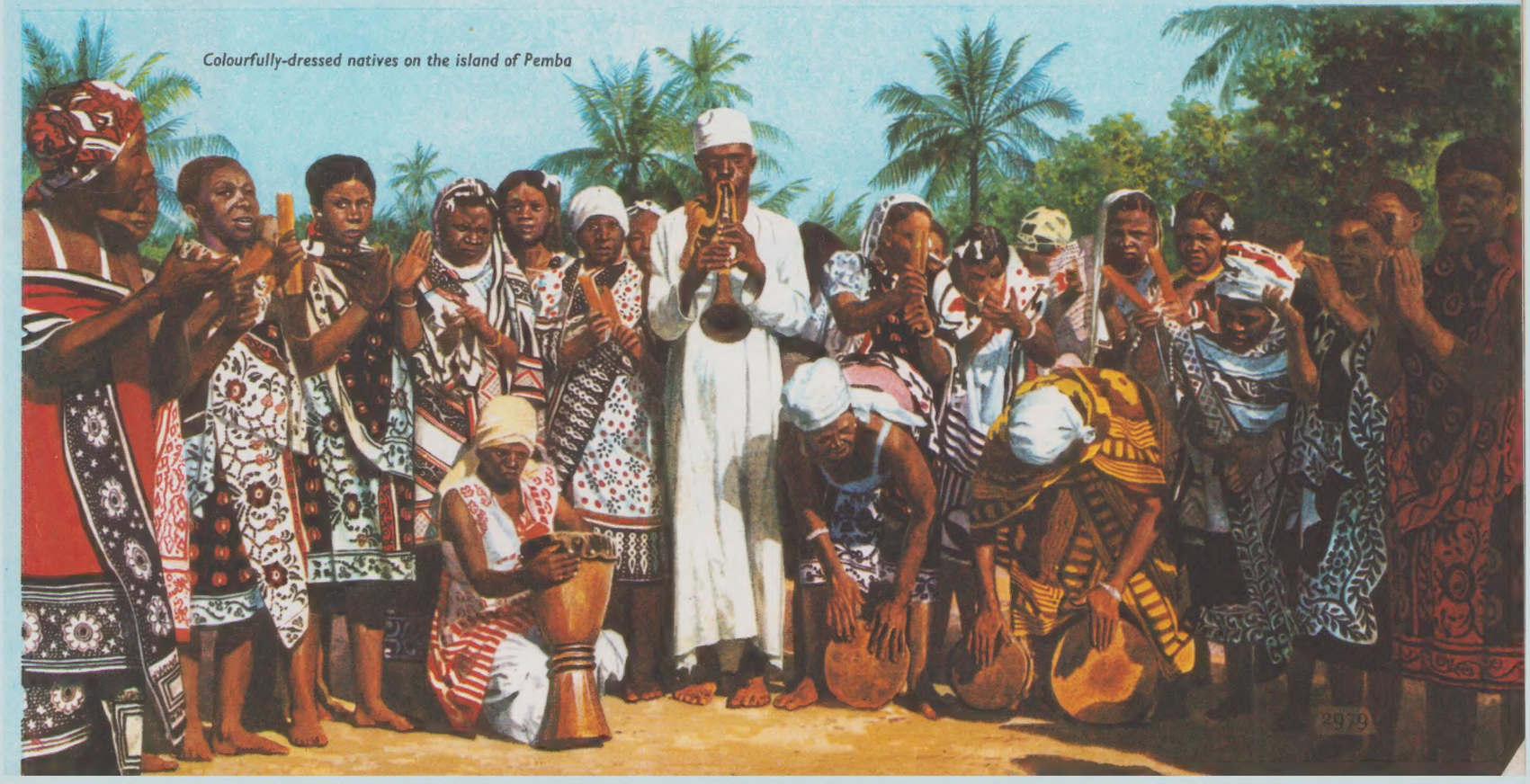
ZANZIBAR: THE ISLE OF CLOVES

The two coral islands of Zanzibar and Pemba (total area 1,020 square miles) are low-lying, with numerous peninsulas and creeks bordered by tidal mangrove swamps. The climate is humid, freshened by sea breezes, and no month is without rain; the heaviest rain falls between March and May, and the islands' position in a monsoon belt results in a total rainfall of 60 inches annually in Zanzibar and over 70 inches in Pemba. The temperature varies only slightly between 76° and 84°F. The vegetation is mostly bushy scrub, left when the dense forests were cleared for cultivation, interspersed with open grassland. Both islands have many brilliantly coloured birds. In places rich soil supports cloves (the principal export) and coconuts, and tropical fruits and rice are also grown.

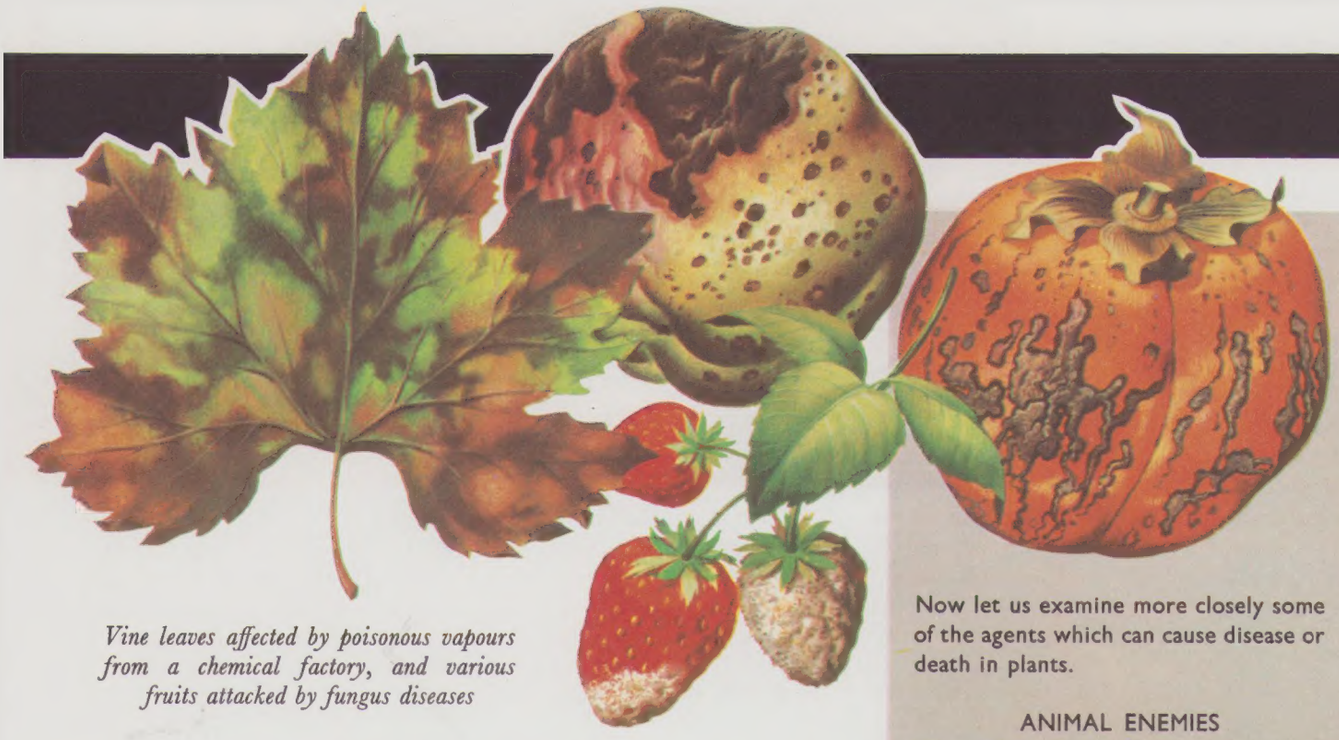
The population is highly cosmopolitan; 77 per cent is made up of indigenous and mainland African tribes, 16 per cent of Arabs, as well as Indians and other Asian people, and there are about 500 Europeans. Zanzibar city is the capital and chief sea port (population 58,000). The main language is Swahili, but Arabic, as well as Indian and Bantu dialects, is also spoken.

ZANZIBAR: HISTORY

Muslim refugees from the Persian Gulf settled in the islands early in the 10th century, but found Bantu tribes already living there. The Portuguese gained control in the 16th century, but when the Arabs finally conquered Mombasa on the mainland a century later the islands came under the domination of the Sultans of Oman. In 1832 Sultan Said moved his capital to Zanzibar and introduced the clove tree. He administered not only the islands but also a large area on the mainland until the coastal territories were divided among European powers. Zanzibar was declared a British protectorate in 1890. Full independence was achieved in December 1963, but was followed by a revolution in January 1964. Sultan Seyyid Jamshid bin-Abdullah and his government were deposed, and a republic was declared; Sheikh Abeid Amani Karume was installed as President. In April 1964 it was announced that Tanganyika and Zanzibar would unite to form one republic, with Dr Nyerere as President.



Colourfully-dressed natives on the island of Pemba



Vine leaves affected by poisonous vapours from a chemical factory, and various fruits attacked by fungus diseases

IN 1787 the prickly pear, a kind of cactus used in making cochineal, was taken from tropical America to Australia to set up a cochineal industry there. The enterprise came to nothing, but the prickly pear established itself and spread in a most amazing fashion. By 1925 it occupied over 60 million acres of Queensland and New South Wales, and its presence made the land useless for pasture or any other purpose. Clearance proved very expensive, and the plant continued to spread rapidly. The trouble was that the prickly pear had been brought from its home in America unaccompanied by any of its natural enemies.

In despair the Australian government sent a team of scientists to see what enemies the cactus had in its own habitat, and eventually a small moth was found in Argentina whose caterpillar feeds on prickly pears. This moth, *Cactoblastis cactorum*, was brought to Australia without any of its special enemies or parasites, and large numbers of its eggs were distributed among the cacti. The effect was amazing: the prickly pear melted away before the onslaught of millions of caterpillars, and the threat from the cactus came to an end.

This is a case where a plant's enemy acted as a friend of man. Usually, however, it is the other way round; almost all our valuable plants have enemies of various sorts which it is our business to defeat and destroy. The examples described on these two pages are of this kind.

THREE MAIN TYPES

The causes of disease and death in plants can be divided into the three main categories described below.

(1) Other living organisms, which are the most common and dangerous enemies. These include grazing animals, insects, fungi, bacteria, and viruses which are so small that they cannot be seen with an ordinary microscope.

(2) Unfavourable conditions, such as excessive heat or cold, too much or not enough water, and unsuitable soil.

(3) Poisonous substances, especially smoke and fumes, and the poisonous 'effluents' discharged into rivers by factories.

Now let us examine more closely some of the agents which can cause disease or death in plants.

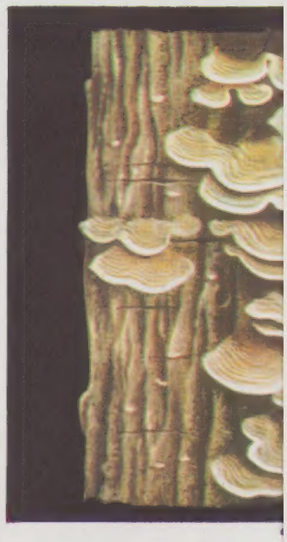
ANIMAL ENEMIES

The cockchafer (*Melolontha melolontha*). This large beetle lays its eggs in the ground in early summer. These hatch into white larvae or grubs, which remain underground for up to four years feeding on the roots of grass and various

A cockchafer (enlarged) devouring leaves.

VEGETABLE ENEMIES

Fungi. Some of the most serious diseases of plants are caused by fungi. One of these is potato blight, which was the cause of the terrible famine in Ireland between 1845 and 1849. Wheat rust is another. This fungus (*Puccinia graminis*) spends part of its life on barberry. Only by completely eliminating barberry from the countryside can wheat be protected from this fungus. Other kinds of fungus, such as *Stereum*, attack trees, eventually killing them.



Wood attacked by the fungus Stereum hirsutum

VIRUSES

Viruses are the smallest of all living organisms and can only live as parasites in the cells of plants or animals. A special kind of microscope called the electron microscope is required to see them. In some ways they are intermediate between living and non-living things; for example, some viruses when purified and concentrated form crystals like minerals. Infection by a virus often causes disease in both animals and plants. The potato suffers severely from virus disease, and many plants are infected by aphids whose winged forms carry the virus from one area to another.

The tobacco plant virus magnified 70,000 times under an electron microscope

THE ENEMIES OF PLANTS

crops, and also on young trees. In summer they live just below the surface, but they burrow deeper in winter. They form pupae or chrysalises underground, and the beetles hatch out in May and June. These are just as destructive as the larvae, for they feed on the leaves of trees; when there are large numbers of them they may do immense damage.

The rose aphis (*Macrosiphum rosae*). This is one of the species of aphids or greenfly that live on plants and suck their sap. The rose aphis is very common in gardens, living on roses and various other plants. It damages plants in two ways: it weakens them by continually sucking the sap, and it carries virus diseases (see below) from one plant to another.

The rose aphis: a winged and a wingless female, magnified about four times

The host of the rose aphis

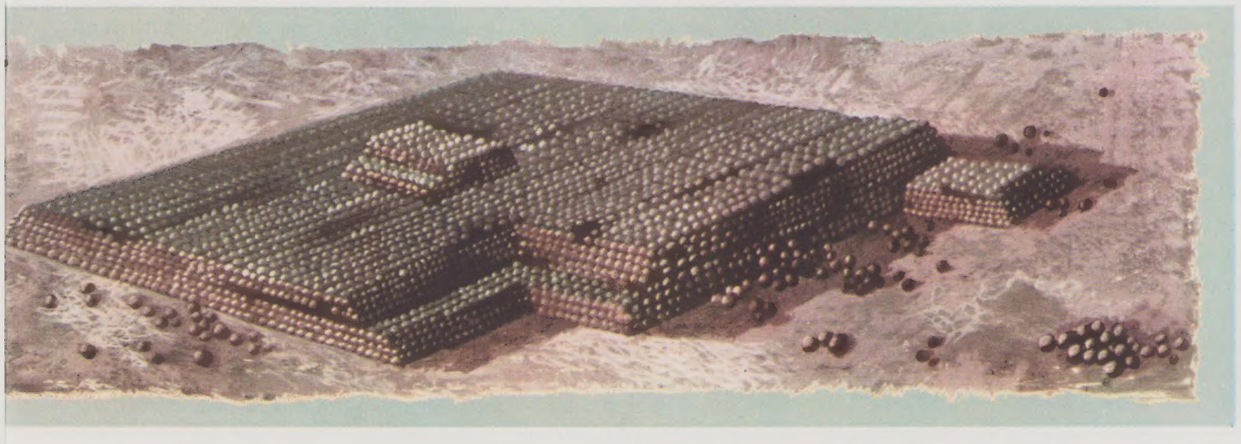
Wood-boring beetles. Most people are familiar with woodworm and death-watch beetles, which bore into the timbers of houses, eventually weakening and destroying them.

Other kinds of beetle, or rather their larvae, do serious harm in forests by boring into the living wood of trees, eating the wood as they go. Trees which are heavily infested by these larvae may die as a result of their activity.

A poplar trunk attacked by wood borers

Plasmopara viticola is the name of a fungus which attacks grape vines. The leaves, shoots, and fruit of the vine become infected. The first sign of the disease is light-green marks which appear on the leaves. Later the affected parts become covered with white mould and finally they shrivel and die.

Fruit and leaf of a vine attacked by Plasmopara



UNFAVOURABLE CONDITIONS AND TOXIC SUBSTANCES

You would not expect to find coconut palms growing naturally in Britain, or Scots pines in Singapore. Any climate is the friend of those plants that are adapted to it and the enemy of all others. In the case of cultivated plants, extreme variations in climate, such as drought or excessive rain, may have disastrous consequences.

The toxic substances produced by industrial processes destroy many plants. Lichens growing on trees are quickly killed by smoke from towns, and water plants cannot flourish in rivers which have factories on their banks.

Special chemicals are now manufactured which are designed to kill certain plants without harming others; these chemicals are called selective herbicides or weed-killers.

LLOYD GEORGE

1912. *Lloyd George at a suffragette meeting. In 1918 he gave women the vote*

'WHEN the English history of the first quarter of the 20th century is written it will be found that the greater part of our fortunes in peace and in war were shaped by this one man.' These words belong to Winston Churchill. They describe the impact on history of David Lloyd George – the mercurial Welshman who rose from humble beginnings to become one of the arbiters of Europe's destiny.

Lloyd George was born in 1863. His father died when he was a child, leaving his mother a poor widow. At the age of 14 David embarked on his career as a solicitor but soon became absorbed with politics. In 1890 he was returned to Parliament in a by-election for Caernarvon Boroughs. He rapidly gained a reputation for his brilliant oratory, and for his vigorous championing of Welsh nationalism, Welsh Nonconformity, and outspoken radicalism. He was one of the most violent opponents of the Boer War, and it was no surprise when, on the fall of the Conservatives in 1905, he was invited to join the Campbell-Bannerman Liberal ministry. However, many were surprised by his immediate appointment to the Cabinet as President of the Board of Trade. But he proved so successful that when H. H. Asquith (see page 2382) became Prime Minister in 1908 the dashing Welshman became Chancellor of the Exchequer.

THE BUDGET CRISIS

Lloyd George had been a success as President of the Board of Trade; as Chancellor of the Exchequer he was a sensation. His first budget, that of 1909, has gone down in history as the 'People's Budget', and it created a constitutional crisis almost without parallel.

In his budget Lloyd George proposed to pay for numerous expenses on social welfare by imposing, in particular, a land tax. This incensed the Conservatives and especially the House of Lords. They rejected the budget, and it at once became apparent that a showdown between the Lords and Commons was likely. The General Election of 1910 was held amid intense excitement. After it the victorious Liberals brought forward a Parliament Bill limiting the power of the House of Lords. The accession of George V in 1910 meant a second General Election that year. Before it the new king had reluctantly promised, if necessary, to create enough Liberal peers to get the Parliament Bill through. The Liberals again won the election, and the Parliament Bill passed the Lords without the creation of new peers. From now on the House of Lords could not veto a bill. It could only hold one up for two years; and it had no power at all over a finance bill, including, of course, the budget.

Lloyd George now turned his energies to further measures for promoting social welfare. In 1911 he produced his famous Unemployment Insurance Bill, which provided security for workers in times of sickness or unemployment. Soon after that a scandal threatened to jeopardise his whole career. He was censured by the Conservative Party for buying shares in the American Marconi company at a time when a big order for the British branch of the company was being negotiated by the Post Office. The Liberals exonerated him, but his prestige was seriously, if only temporarily, damaged.

The years before the Great War were overshadowed by the threat of civil war in Ireland, during which Lloyd George played a leading role as peace-maker. Then, on 4th August 1914, Great Britain went to war with Germany. Lloyd George, who had advised peace, urged the declaration of war when the Germans invaded Belgium. And it was upon him, as Chancellor of the Exchequer, that one of the first great tasks of the war – the supply of money – fell. His skill in raising loans and negotiating with the banks placed war finance on a firm basis and earned him praise from all parties.

The first year of the war went badly for the Allies, and it was apparent that British soldiers were being sent to the front with insufficient supplies of arms and ammunition. On 19th May 1915 the Liberal government broke up, and a coalition between Asquith and the Conservative leader, Bonar Law, included Lloyd George as the vital new Minister of Munitions.

WAR LEADER

Lloyd George's boundless energy and enthusiasm roused a tremendous response, and armament production increased enormously. But he became more and more critical of the government's war conduct as a whole. In 1916 he was appointed to the War Office, which gave him more scope to pursue his criticisms of the government's policies.

The fact was that Lloyd George had become dissatisfied with Asquith. When Lloyd George proposed that a small committee should take charge of the direction of the war he recommended that the Prime Minister should not be its chairman. Asquith's pride was hurt, but Lloyd George was adamant. He resigned his office, and Asquith could

Paris 1919. Lloyd George and Marshal Foch (centre). The combination that did so much to win the war

not form a new government without him. On 6th December 1916 Lloyd George became Prime Minister of the coalition.

Lloyd George made an inspiring war leader, and his great oratory rallied the country to his side. Among his most important acts was his part in creating a unified command for the British and French armies, achieved when Marshal Foch became Supreme Commander in April 1918. After that the tide turned for the Allies, and on 11th November Germany signed the surrender. Lloyd George found himself one of the prime negotiators of the future of Europe, alongside President Wilson of the United States and Clemenceau of France. Their decisions were embodied in the Treaty of Versailles.

Wilson and Lloyd George worked hard to moderate the revengeful demands of Clemenceau, but they had to make concessions to France which were harder on Germany than Lloyd George would have liked.

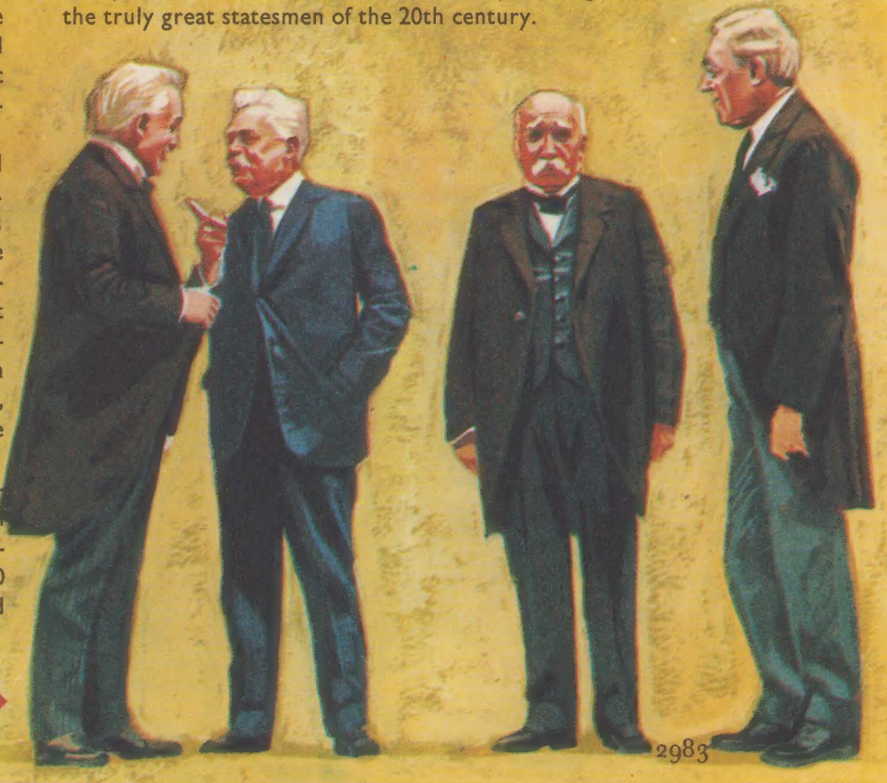
The Versailles treaty was signed on 28th June, and Lloyd George, defending it before Parliament, was successful in having it ratified at home on 3rd July.

After the war Britain entered a period of hardship. Lloyd George averted strikes among the coal miners and railway workers, and passed a series of measures on housing, suffrage, and land. But the economic discontent continued. Lloyd George's position grew weaker, and by-elections went increasingly against the government.

It must be remembered that after the war Lloyd George was still Prime Minister of a coalition government, re-elected after the war. Most of the true Liberals were ranged in opposition alongside Asquith, so that the Welshman was entirely dependent on the Conservative vote. But, particularly after the Irish treaty of 1921 (which conceded dominion status to southern Ireland), many Conservatives lost faith in the Prime Minister. They were further alienated by the so-called 'honours scandal'. Lloyd George was suspected of corruption in the distribution of public honours, and when, in October 1922, Bonar Law spoke against the coalition, Lloyd George resigned. He was replaced by a Conservative government under Bonar Law.

The Liberals were now irretrievably ruined. Lloyd George's followers reunited with Asquith's after the 1922 election with Asquith as the party leader. But their support in the country decreased alarmingly. In 1924 Liberal membership in the Commons sank to 40 members and politics were dominated by the Conservative and Labour Parties. In 1926, after another quarrel with Lloyd George, Asquith formally resigned the Liberal leadership, but under Lloyd George the party met with little greater success. In 1929 the Liberal membership had increased to 59 seats, but Lloyd George's days of real political influence were over. All his efforts to rally the Liberals failed, and during the Second World War his defeatism (in contrast to his great efforts in the First World War) earned him much unpopularity. In 1944 he was raised to the peerage as Earl Lloyd George of Dwyfor. He died on 26th March 1945.

Lloyd George's political achievements were immense. He laid the foundations of the welfare state and was in the forefront of the battle to limit the power of the House of Lords. He led his country to victory in the 'war to end all wars'. As an orator he was supreme and as a leader one of the most inspiriting in British history. But his often devious methods and occasional indiscretions over, for example, the disposal of honours, left an impression among many that he was not quite to be trusted. Nevertheless, Lloyd George ranks as one of the truly great statesmen of the 20th century.



Versailles 1919. Left to right: Lloyd George, Orlando of Italy, Clemenceau of France, and Wilson of the United States

THE ARYANS

ADOLF HITLER, in order to justify the Nazi racialist policy which aimed at *genocide* (the extermination of an entire race), seized on the theories of some 19th-century German scholars about the ancient 'Aryan' peoples. He claimed that these Aryans, the early conquerors of Europe, were a fair-haired, blue-eyed people from whom 'true' Germans were directly descended: a 'master race' superior by their very nature to the Jews whom Hitler wanted to destroy. It is unscientific and wrong to claim that any race is *by nature* superior to any other. But what was the scientific theory on which Hitler based his perverted argument? Who were the ancient Aryans, and where did they come from? Were they fair-haired and blue-eyed? And do we know that they existed?

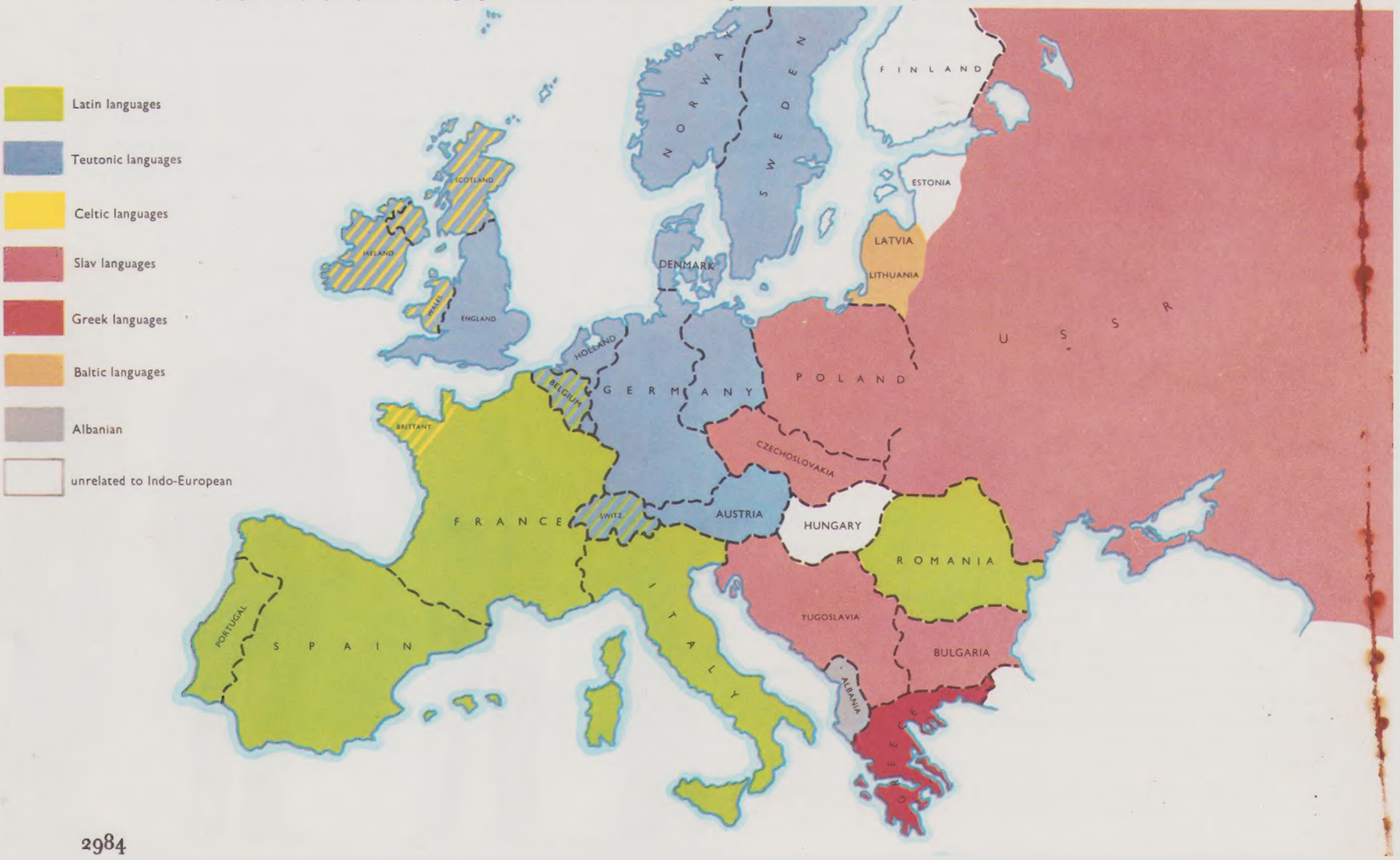
The argument for the existence of a dominant Aryan race goes like this. We know that north-west India was invaded in the 2nd millennium B C by a people who called themselves Aryans ('noblemen') to distinguish themselves from the local inhabitants whom they conquered. We also know that there are connections between the language of these Indo-Aryans (Sanskrit) and the languages of most European countries, including Germany.

Some scholars, believing that Sanskrit was the oldest of this group of related languages, concluded that the Sanskrit-speaking Indo-Aryans were members of a race which, as well as conquering India, had migrated westwards to Europe, taking the language with it. Hitler combined this argument with the fact that the Indo-Aryans were fair-skinned, according to their own sacred book of hymns, the *Rig-Veda*. But it is an argument which contains a glaring error – that peoples who speak related *languages* must be related in *race*. We need only consider the number of different races who speak English today to see that this is a fallacy. The speakers of any language are usually found to be of mixed racial origin. This is not an invariable rule; but we can at least say that there is no good evidence for believing that all those ancient peoples who spoke languages related to Sanskrit were of a common racial stock, or of a single conquering tribe. Thus the purity of Sanskrit is probably due to the Aryans' natural conservatism, and not necessarily to the fact that they were nearer to the original Indo-Europeans than were the Greeks or Celts.

RELATED LANGUAGES

The languages which belong to this related family are called 'Indo-European' and fall into two main groups. First there are the Centum languages, called after the Latin word for 100, with its hard 'C': Greek, Latin, Celtic, the Germanic group (which includes the modern Scandinavian languages, English, Dutch, and German), and ancient Hittite. The second group is the Satem, called after the Sanskrit for 100, with its soft 'S'; the Satem languages tend to replace the guttural 'Ks' and 'Gs' of the Centum group with sibilants. Satem languages are Sanskrit, the ancient Iranian dialects, the Slavonic languages, the Baltic languages, and Albanian. Thus the only important modern European languages which are not of the Indo-European family are Turkish, Finnish, and the Magyar language of Hungary which originate from totally different roots.

Why are we so interested in the ancient Indo-European peoples? The map below gives an answer. The languages of all the countries except those shown in white are derived from the language these people spoke. The languages of some Asian countries – among them India, Pakistan, Afghanistan, and Persia – also share this ancestry



None of the Indo-European languages is the original from which all the others derive. Probably they are all descended from a mother-tongue, which is now lost to us and which we may call 'pure Indo-European'.

THE ORIGINAL INDO-EUROPEANS

It used to be thought that this mother tongue was first spoken in Asia and thence carried westwards to Europe. But it now seems more likely that the original Indo-Europeans lived in Europe. This is deduced from the vocabulary of the older Indo-European languages. For example, Indo-European words for the sea, such as the Latin *mare*, seem to have meant, originally, 'marsh'; so probably the Indo-Europeans lived inland and knew nothing of the sea. We can tell by similar means that they grew cereals, reared horses, cattle, and sheep, and knew of no metals except perhaps bronze and copper. All this, and other evidence, indicates the plains of Hungary, far from the sea, temperate in climate, and rich in prairies and pasturage, as a likely home for the original Indo-Europeans; however, some authorities think the area of Russia east of the Caspian Sea more probable.

Thus, with the aid of some guesswork, we have built up a picture of a people living possibly in central Europe, and speaking Indo-European as their mother tongue. Their culture seems to have been of the later Stone Age (Neolithic), although they knew of the existence of bronze. They used stone tools and weapons, reared cattle for milk, and grew cereals. They lived in close-knit family groups; a son who got married, for instance, would bring his bride home with him to live within his father's family. Power was in the hands of tribal chiefs. The religion of the Indo-Europeans, it seems, was a primitive cult of the Sky-Father and the Earth-Mother.

THE SPREAD OF THE INDO-EUROPEAN LANGUAGE

How did this Indo-European language come to be spread throughout northern India, Iran, and most of Europe? If the theory of a Hungarian origin for the mother tongue is correct, its transmission as far as India must have taken a long time – perhaps thousands of years. In any case, a long period of transmission is likely, because when the languages of the Indo-European family appear in Europe and in India they are already very different from each other; and if it were a case of one conquering race, which moved swiftly, taking its language with it, we should expect that language to remain much the same.

The Aryans invaded India, the Celts settled in western Europe, and the Greeks entered Greece, all in the 2nd millennium B C. It probably took about 2,000 years for the mother tongue to spread outwards and develop into complex, individual languages like Greek and Sanskrit; so perhaps the transmission of Indo-European from its original country began in about 4000 B C.

We do not know how this transmission took place. There must have been migrations of tribes, conquests, and inter-marriage with conquered peoples (and this alone would destroy the 'pure' Indo-European stock, if it ever existed).

The Rig-Veda, which tells us much about the Indo-Aryans, describes many of their gods. The most popular was Indra, above, who helped his worshippers in battle

THE ARYANS IN INDIA

The Aryan invaders of India certainly tried to preserve their purity of race. The *Rig-Veda* tells of the fair Aryan tribes making war on the darker local tribes in the area of the Indus and its eastern and western tributaries. They tended to be divided into specialised classes (priests, nobles, artisans, and so on) according to divisions which later hardened into the 'caste' system (see page 1153). And just as they preserved their racial purity, so they preserved the Sanskrit language from new and foreign influences.

THE RIG-VEDA

The *Rig-Veda*, written in Sanskrit, consists of over a thousand poems or 'hymns', varying from prayers to popular songs. It tells us a great deal about the gods worshipped by the Indo-Aryans. When read in conjunction with archaeological evidence it gives us a valuable insight into the life of the Aryans. We know that they were pastoral settlers, led in war by tribal chiefs, reliant on swift horses and chariots. Their horses were probably of Mongolian or Upper Asiatic stock, and they kept many cows.

CHANGING THEORIES

In the 19th century, and even more recently, scholars thought they knew who the Indo-Europeans were. Now we are not so sure. The evidence for them remains linguistic. No one can point to a skeleton and say with certainty: 'This is one of the original Indo-Europeans!' But archaeological evidence may one day show us exactly who they were, where they came from, and how their language came to spread over Europe and much of Asia.

These are important questions; for the most highly developed languages of the western world are Indo-European, and we cannot fail to have a lively interest in the people from whom we ourselves derived the rich and complex language which we use every day.

Agni, the two-faced Aryan god of fire who conveyed sacrifices to heaven

Sūrya, the sun god who drove across the sky in a chariot

DID YOU KNOW?

1. *The discovery that Sanskrit, Latin, and Greek had a common origin was made quite independently by two people living in India in the late 18th century. They were Coeurdoux, a French missionary, and Sir William Jones, an English administrator.*
2. *'Father' in many Indo-European languages is very similar: pater (Latin and Greek); pitar (Sanskrit); athir (Irish); fadar (Germanic).*

COLONIAL EXPANSION IN THE 19th CENTURY

WE are used to thinking of the 19th century as the age of nationalism, when countries like Greece, Serbia, Bulgaria, Italy, and Germany achieved independence or unity. But it was also a time when vast areas of the world came under the control of the great European powers. For the 19th century was also the age of colonialism and imperialism. Sometimes this took the form of direct 'colonising', when huge regions like Canada were increasingly settled by surplus white populations. Sometimes it took the form of the annexation of already heavily populated countries like Algeria and Tunis. Sometimes it simply meant the expansion of frontiers like the Russian penetration into Siberia and central Asia.

Whatever form it took – settlement, annexation, or penetration, overseas or not – 19th-century imperialism led to an unprecedented scramble to establish 'spheres of influence'. The activities of traders or missionaries might give one nation a particular concern over a particular area. Soon the government of that nation would seek acknowledgement of its special 'interest' by establishing a protectorate, or enforcing treaty rights, or by direct annexation.

BRITISH IMPERIALISM

The British empire was already great when the 19th century opened. The white colonies of Canada, Australia, and New Zealand were particularly successful and all achieved full responsible government under the British Crown before 1860. The other main area of white colonisation, South Africa, presented a greater problem. The numerous Dutch settlers, or Boers, repudiated British authority and it was only in the 1870s that Cape Colony was granted responsible government. 'Boer wars' were fought in 1848, 1881, and 1899–1902, and the problem was not solved until the British and Dutch settlers were united in the Union of South Africa (1909–1910).

British imperialism was not only concerned with finding room for her surplus white population but also with furthering her economic and strategic interests. Britain had acquired Cape Colony from the Dutch during the Napoleonic Wars, largely to safeguard the route to India where she had extensive possessions. She also annexed Mauritius for the same reason, and the annexation of Aden in 1839 still further protected the route to India. The

THE MAIN COLONIAL EMPIRES IN 1914

A bloody episode during the long and costly campaign which brought Algeria into the French empire

logical outcome of the British control of India was Disraeli's proclamation of Queen Victoria as Empress of India in 1876.

Besides India, Britain had vital trading interests in China, and the annexation of Singapore (1819) and Hong Kong (1843) were intended to protect these interests.

THE FRENCH EMPIRE

After the Napoleonic Wars France was allowed to retain Guiana and certain West Indian islands, but it was clear that further French expansion could not take place in the Americas. France, therefore, turned her eyes towards Africa and particularly to Algeria. Long, costly campaigns were launched, and in 1847 Algeria became part of France. The establishment of a French empire in Algeria was of great significance. It meant not only that other countries would seek 'a place in the sun' in North Africa, but also that France would be suspicious of other powers in the region. The result was that by 1880 France's position in Algeria was matched by British interests in Egypt and Italian interests in Tunis, with France's suspicions of both growing.

France also pursued an active policy in the Far East. She gained important trade privileges in China, and the murder of some missionaries gave her the excuse to annexe, in the 1860s, what became French Indo-China.

THE CONFLICT IN ASIA

While Britain was establishing herself in India and France in Indo-China, Russia was steadily extending her boundaries. This expansion took place in two main directions – towards China and towards India. Her progress towards China soon took her actually inside the Chinese frontiers, and the province of Amur was annexed from China. In 1860 Russia achieved her long-cherished ambition of establishing a port on the Pacific – Vladivostok. Russian expansion across Turkestan soon took her towards the Indian frontier. Tashkent fell in 1864, and soon Samarkand and all eastern Turkestan was hers. Western Turkestan fell in 1873, and a further gain for Russia was the province of Kars, annexed from Turkey in 1878.

The remarkable growth of Russia meant that only Afghanistan was left as a buffer state between Russia and the British in India. In 1885 an international crisis over Afghanistan brought Russia and Britain to the brink of war. But the crisis passed, and in 1892 Russia turned once more away from India and towards Manchuria.

THE SCRAMBLE FOR AFRICA

The last quarter of the 19th century saw a large-scale scramble for territories in the 'dark continent' of Africa. As we have seen, the British, the French, and the Italians all had interests in North Africa. In 1878 the suggestion was made that France might occupy Tunis as compensation for the British occupation of Cyprus, though such a move would obviously upset Italy. In 1881 France suddenly annexed Tunis, much to the fury and dismay of Italy. A year later Britain (who had acquired interests in Egypt by the purchase of Suez Canal shares in 1875) occupied Egypt to restore law and order. Her action antagonised France and hostility was intensified when Britain occupied the Sudan in 1898. War seemed imminent, but six years later the two nations joined in the famous *Entente Cordiale*.

The German chancellor, Bismarck (see page 1332), had encouraged French colonialism to divert her from European questions. In 1884 Germany herself decided to join the scramble for Africa. Bismarck acted with typical speed and thoroughness. In April 1884 he proclaimed a protectorate over a large area of south-west Africa and a few months later annexed the Cameroons. He also annexed 'German New Guinea' and Tanganyika.

Perhaps the most impressive gains in Africa were made by Belgium. She laid claim to the huge area which became the Belgian Congo, and after 1885 virtually excluded other nations from this region.

There were many other acquisitions in Africa. Italy, her pride hurt over Tunis, annexed Eritrea in 1885 and part of Somaliland in 1892. Britain made many gains, including the Rhodesias (1889–1890), Nigeria (1881–1895), Uganda, 'British East Africa' (1894), and Zanzibar (1890). France acquired the 'French Congo' (1880), Senegal (1885–1887), 'French Guinea' (1885), and Madagascar (1896).

The result of these immense transfers of land in the 19th century can only be summarised. France, by her annexation of Tunis, antagonised Italy and drove her into an alliance with Germany and Austria-Hungary. Russia, pushing into China, used French money to build her trans-Siberian railway, and France and Russia came together against the Triple Alliance. Russia's activities in the Far East led to a disastrous war with Japan, but at least conflict with Britain over Afghanistan was avoided. As the 20th century opened, conflict grew over Morocco where both France and Germany had important interests. All this had major consequences in the development of the armed camps which ultimately fought the First World War.

MANATEES AND DUGONGS

IN the narrative of the voyages of Henry Hudson, published in 1625, the following passage occurs: 'This evening [June 15] one of our company, looking overboard, saw a mermaid, and, calling up some of the company to see her, one more of the crew came up, and by that time she was come close to the ship's side, looking earnestly on the men. After a little a sea came and overturned her. . . . In her going down they saw her tail, which was like the tail of a porpoise, speckled like a mackerel. Their names that saw her were Thomas Hilles and Robert Rayner.' Even as recently as 1809 a letter in *The Times*, written by a Scottish schoolmaster, described in great detail a mermaid that he had seen on a rock in the sea near his home.

This belief in mermaids – creatures with human upper halves and fish-like lower halves – persisted well into the last century, and goes far back into history. The sirens of Greek legend, who lured mariners on to the rocks by their beauty and sweet singing, were a kind of mermaid, and some of the ancient gods and goddesses also had this half-fish, half-human form.

The origin of the belief in mermaids is not known for certain, but some people suppose that it is based on the Sirenia or sea-cows. This is possible, though if you look at the pictures on these two pages you may think it rather doubtful.

THE SIRENIA

The skeleton of a dugong. Note the vestiges of hind limbs

Sea-cows (Order Sirenia) are mammals which are entirely adapted for life in the water. There are several species known as manatees and a smaller one called the dugong. All of them have bodies shaped rather like that of a seal. Their front limbs are flippers, and although there is no external sign of hind limbs, part of a pelvic girdle is present in their skeleton (see above). Their tails end in a flattened horizontal fin, which they use for swimming; the dugong's fin has two flukes, like those of a whale, while the manatee's fin is shaped like a rounded flap.

Sea-cows are entirely vegetarian and live on seaweed and other marine plants. They have grinding cheek-teeth and horny plates on their palate and lower jaws. Their lips are thick and bristly and they use them for drawing food into their mouths. Apart from this their skin is hairless.

The Sirenia have no close relatives among the other mammals but are believed to be very remotely related to elephants.

The grotesque face of a manatee

All the living sea-cows inhabit coastal waters and the mouths and lower reaches of large rivers in tropical and subtropical regions. They are most gentle and inoffensive creatures, and often approach boats, standing upright in the water to inspect them. Their upright posture, and the habit which the mothers have of holding their young against their breasts with their flippers, do give them a slightly human aspect – and have possibly formed the basis of some mermaid stories.

Normally the young of the sea-cows are born one at a time, although manatees are sometimes seen nursing two babies. South American fishermen believe that the young of the manatees are, in fact, always born singly, but that a mother manatee will hand over her child to a 'friend' to look after while she dives below the surface to search for seaweed; there is no evidence to prove this interesting theory wrong.

Sea-cows dive only to moderate depths and have to come to the surface rather frequently to breathe; a manatee can stay under water for only about 4 minutes. All the sea-cows, especially the dugongs, are constantly being hunted and are now in some danger of extinction.

Distribution of the Sirenia, shown in red

WHERE THEY LIVE

Sea-cows are found along all the warm coasts of the world except the American Pacific coast. On the Atlantic seaboard of America they range from Florida and the Gulf of Mexico to southern Brazil, and are found in the Amazon and Orinoco rivers. In Florida they are at the northern limit of their range, and sometimes a sudden drop in temperature

Dugong

A 'MERMAID' OF SEVERAL TONS

In 1741 the packet boat *St Peter*, under the command of Vitus Bering, set out from a Russian port in Siberia to explore the extreme north-eastern coast of Asia. After discovering the strait which divides Asia from America, and which is now named after Bering, the expedition had to camp for some months on an island. There the ship's physician, Dr Steller, wrote a detailed account of some extraordinary animals which they found, and which are now known as Steller's sea-cows. These creatures were rather like dugongs, but 25 to 30 feet long and $3\frac{1}{2}$ tons in weight. They lived in shallow water, and the crew of the *St Peter* killed a number of them for food. Only 27 years later the last of them was killed by seal hunters, and Steller's sea-cows were extinct.

will cause the death of large numbers of them. These American sea-cows are manatees. Another kind of manatee is found across the Atlantic Ocean along the coast of West Africa, where it ranges far up the Niger and other large rivers.

The dugong is found round the warmer coasts of the Indian and western Pacific Oceans, but it has probably been exterminated in some places within these areas.

A manatee and a dugong in their natural surroundings, the coastal 'pastures' of the warm tropical seas

Manatee

TWO LIVING FAMILIES

The existing sea-cows are divided into two Families: the manatees (Trichechidae), and the Dugongidae which is represented by a single species.

The manatees (*Trichechus*). The African manatee (*Trichechus senegalensis*) is quite distinct from those of the Americas, but zoologists are not in agreement as to the number of species into which the American manatees should be divided. Some say they all belong to one species, others that there are three distinct kinds. It seems reasonable to recognise two: *Trichechus inunguis* of South America and *Trichechus manatus* of the Gulf of Mexico and the West Indies. The manatees differ from the dugong most obviously in the form of their tail, and they are rather larger, growing to about 15 feet. The manatee's upper lip is split into two halves, which have stiff, incurved bristles and work against each other in gathering food and stuffing it into the mouth. Manatees also use their flippers in feeding, and the flippers of the African species have traces of nails at their ends.

The dugong (*Halicore dugong*). All dugongs are now regarded as belonging to one species, but there are small (subspecific) differences between those found in the Australian region and those found in the Indian Ocean. The dugong is bluish-grey in colour and grows to about 10 feet. Its molar teeth are peg-like, and the males have a pair of large tusks in their upper jaws. The dugong's upper lip overhangs its muzzle, rather as if it were just beginning to grow a trunk. Unlike the manatees, dugongs do not go far up rivers, but live in the sea and in large estuaries. Formerly they swam in great herds, but their numbers have been greatly reduced by hunting. Breeding is slow; each mother only produces one baby in a year.

CLASSIFICATION

Class	*Order*	*Family*	*Genus*	*Species*
Mammalia	Sirenia	Trichechidae	Trichechus	senegalensis
				inunguis
				manatus
		Dugongidae	Halicore	dugong
		Rytinidae	Rytina	stelleri

HISTORY OF USSR (part two)

WE saw on page 2971 how by the death of Ivan the Terrible in 1584 the Russian state had grown enormously around its nucleus of Moscow. Ivan was the first Russian ruler to have himself proclaimed Tsar. From then until the Communist Revolution of 1917 all the Russian rulers were called Tsars. During the long rule of the Tsars Russian history contained two broad themes: the first was the continual expansion of Russian territory in all directions – north, south, east, and west; the second was the worsening condition of the Russian peasants, or serfs, and the increasing demands for their liberation.

The death of Ivan the Terrible was followed by the 'time of troubles' during which Russia was torn by civil war as rival aristocratic, or boyar, families fought for power. The weakness of Russia enabled the Swedes and Poles to conquer vast stretches of Russian territory, and the Poles even managed to capture and burn Moscow. Finally the boyars settled their differences by electing as Tsar a member of the Romanov family who proved acceptable to all parties. Michael Romanov (1613–1645) became Tsar in 1613. The Romanovs continued to rule Russia until 1917.

Russia becomes a European power

The 17th century was a period of expansion. Under Alexis (1645–1676) Poland was forced to cede to Russia all territory east of the Dnieper as well as Kiev and Smolensk. At the same time expansion was taking place in the east as Russian pioneers penetrated the almost uninhabited wastes of Siberia. Peter the Great (1682–1725; see page 2172) was perhaps the greatest of all the Russian Tsars. During his reign Russia adopted many techniques from the more advanced West; and he built a new capital, St Petersburg, as his 'window on the West' on the Baltic Sea.

Peter's conquests were extensive. They included Azov from the Turks, which gave Russia an outlet on the Black Sea, and – in the Great Northern War against Sweden – Livonia, Estonia, Ingria, Karelia, and part of Finland. Peter had transformed Russia from an Asiatic into a European power and made her the greatest of the Baltic nations.

A statue of Peter the Great – the Tsar who made Russia a European power

Left: the Russian empire in the 18th century; right: Peter the Great cuts off a boyar's beard in pursuit of 'Europeanisation'

A group of peasants – poor, underfed, badly

Impressive as were Peter's conquests, his rule contained one serious fault. He did nothing to improve the lot of the Russian peasantry. Throughout the 17th and 18th centuries the condition of the Russian serfs deteriorated until they were regarded by their owners merely as pieces of property to be retained, bought, or sold.

Russian progress continued during the 18th century. In the Seven Years War (1756–1763) Russia took part for the first time in western European politics on a major scale, and Catherine II, the Great (1762–1796; see page 1418), made important gains for her country at the expense of Poland. In 1772 she took part in the first partition of Poland, which gave her Dvinsk, Polotsk, Vitebsk, and Mogilyov, with 1,600,000 inhabitants. In 1793 a further partition gave Russia half of Lithuania and all of the Ukraine west of the Dnieper, and two years later a third partition gave her the rest of Lithuania and the Duchy of Courland.

Meanwhile, even more important were Catherine's conquests in the south. In 1783 she annexed the Crimea from Turkey and made further extensive conquests along the Black Sea.

Catherine, like Peter the Great, made no attempt to deal with the serf problem. But, particularly after a spirit of liberalism had been kindled by the French Revolution (1789), the question be-

Catherine the Great – made important conquests

clothed, and overworked. Throughout the 17th and 18th centuries the condition of the serfs continued to deteriorate

came impossible to ignore. Paul (1796–1801) made a law in 1797 forbidding the exaction of more than three days' forced labour from the serfs. His law proved impossible to enforce but it was a first attempt to solve the problem that was to dominate Russian domestic policy throughout the 19th century.

Freedom for the serfs

Paul's successor, Alexander I (1801–1825), passed a number of laws slightly easing the burdens of the peasantry, and he even freed some 50,000 serfs in 1803. But any plans he might have had for total liberation were halted by the war against Napoleon. In 1812 Russia was invaded by the French Emperor at the head of his Grand Army (see page 2507). Russian patriotism was aroused, and Napoleon was defeated; but after the war Alexander became increasingly reactionary, and liberal secret societies, critical of the government, began to spring up.

The accession of Nicholas I (1825–1855) was greeted by a revolt – the 'Decembrist' rising. Nicholas crushed it and pursued a policy of repression and censorship which he hoped would stamp out revolutionary ideas. But resentment against his harsh rule grew, intensified by Russia's failure in the Crimean War (see page 2572) which emphasised the weakness of the government.

Nicholas's successor, Alexander II (1855–1881), was, perhaps, the only truly liberal Tsar Russia ever had. On 3rd March 1861 he proclaimed the momentous decree granting independence to all Russia's serfs. Among his other reforms were the introduction of trial by jury, improvements in education, and the setting up of a more democratic form of local government. But Alexander did not go far enough for certain left-wing fanatics, some of them influenced by the ideas of Karl Marx (see page 2960). In 1881 Alexander was assassinated in a bomb explosion. Among those executed for complicity in this plot was the elder brother of V. I. Lenin.

Alexander III (1881–1894) completely reversed his predecessor's policy, and among the Russian lower classes revolutionary ideas spread. This was helped by the fact that many of those peasants liberated by Alexander II found themselves worse off than before. Some drifted into the cities to form a large, impoverished, urban 'proletariat' of the kind needed for a 'Marxist' revolution.

Nicholas II (1894–1917) was as illiberal as his father but far less able. A disastrous war with Japan (1904–1905) led to widespread riots, and Nicholas was forced to grant constitutional reforms of a democratic nature. But he soon reverted to his illiberal policy, and the years before the outbreak of the First World War saw many strikes and riots which hinted that Russia was on the brink of revolution.

During the First World War (see page 2731) Russia fought against Germany and suffered more heavily than any other belligerent country. Hostility to the feeble, inefficient, and corrupt Tsarist regime grew stronger and stronger. Finally, in March 1917, a revolt broke out in Petrograd (St Petersburg). Government offices were seized, and regiments of soldiers joined the rebellious common people. A provisional committee was elected which assumed the government of Russia. Included in it was a member of a party called the Social Revolutionaries – Alexander Kerensky. The 'Marxist' party, or Social Democrats, had not yet become prominent. But the inclusion of Kerensky underlined the left-wing nature of the revolt. On 14th March Nicholas abdicated, and the long rule of the Tsars was over. A provisional government, partly socialist, was in power, and the stage was set for the most important and decisive event of modern Russian history – the Communist revolution.

Alexander I – the liberal who changed his ways

Nicholas I – his policies aroused opposition

Nicholas II – last of the Russian Tsars

APOPLEXY

APOPLEXY means 'to strike down', and it aptly describes the illness which, within a few minutes, fells an apparently healthy person unconscious to the ground. In everyday language apoplexy is described as a *stroke*, and in the minds of most people it is associated with grave and hopeless consequences. During the last quarter of a century, however, there has been a considerable change in the attitude of many doctors to this illness. They are no longer content merely to make the victim of apoplexy as comfortable as possible for the remaining fragment of his or her life, but instead they seek to provide each patient with a new lease of life. The patient is taught how to live with the infirmity, and in favourable cases may even return to his work.

Apoplexy is chiefly a disease of elderly people, and it is frequently associated with diseases of the circulatory system, particularly high blood pressure. Very often apoplectic patients are considerably overweight, which adds considerably to the difficulties of nursing them.

THE CAUSE OF APOPLEXY

Apoplexy is caused by a derangement of the blood supply to a part of the brain. The nerve cells and fibres in the affected region immediately cease to function properly and quite soon they die. If the amount of brain tissue affected is large, the victim of an apoplectic attack is unlikely to survive. If the amount is smaller, he becomes unconscious, often remaining in this state for several days.

The part of the brain most commonly affected by apoplexy is a region where many of the motor nerve fibres which carry nerve messages to the muscles of the body are bunched closely together. Consequently, when the patient recovers consciousness it is often found that the death of those fibres has caused partial paralysis.

An apoplectic attack which involves the right side of the brain rather surprisingly causes paralysis of the left side of the body. This is because the nerve fibres which carry the motor impulses from the brain to the muscles cross over in the lower part of the brain. In the same way an apoplectic attack which affects the left side of the brain causes paralysis of the right side of the body. This is a more serious handicap, for the use of the right hand is lost and the patient may also have lost the ability to speak.

This diagram shows how the right side of the brain serves the left side of the body, and vice versa

There are three common ways in which the blood supply to the brain may be deranged, and all of them chiefly affect elderly people.

1. **Cerebral haemorrhage.** In this condition one of the arteries serving the brain begins to leak. Blood escapes from the artery into the brain tissue where it forms a clot which destroys the adjacent nerve cells.
2. **Cerebral thrombosis.** In cerebral thrombosis a blood clot forms *inside* one of the brain's arteries. The artery is thus blocked and no blood can flow to the region of the brain which it serves.
3. **Cerebral embolism.** Here a cerebral artery is obstructed not by a clot which forms inside it but by part of a clot which has formed in another part of the body and which has broken away into the bloodstream.

FIRST AID

Because apoplexy is a disease which so often strikes quite suddenly, anyone at any time may be called upon to render first aid to the unfortunate victim of an apoplectic attack. No special skill is needed to do this, and expert assistance usually arrives quickly.

The victim of an apoplectic attack almost always falls to the ground, and by the time first aid arrives he may be deeply unconscious and breathing heavily through his mouth. Only if he is lying in a dangerous position in the road or by a fire is it necessary to move him. It is enough to make sure that he can obtain air and that there are no tight clothes around his neck. If the patient is having difficulty in breathing his head should be turned to one side so that his tongue does not fall to the back of his throat.

A pillow placed gently under his head and a coat to provide warmth are an advantage, but under no circumstances should any attempt be made to give anything by mouth. Any violent movements of the limbs (an *apoplectic fit*) may be gently restrained.

When expert assistance arrives the patient can be moved. If his attack has occurred in the street or at work it is likely that an ambulance will be called. The attendants will be familiar with such cases and will quickly place the patient on a stretcher and take him to hospital. If the attack has occurred at home, a doctor usually provides assistance. He knows how to get the patient to bed and what treatment is needed.

NURSING

Nursing the apoplectic patient requires great skill and experience, and it is usually beyond the capability of an untrained person. For this reason most victims of apoplexy are either sent to hospital or nursed at home by a district nurse. It is extremely important that the patient should be moved in his bed at frequent intervals to prevent the development of bed sores, and that the sheets should be drawn tight and changed as soon as they become soiled.

Very soon after he regains consciousness the rehabilitation process begins. Under the guidance of a physiotherapist the patient first does exercises in bed, then sits on the edge of the bed, and then moves into a chair. Next comes the stage of using wooden rails, furniture, crutches, and sticks as he learns to walk again. Exercises for a paralysed arm or hand are encouraged all the time, and speech training is given if it is necessary.

Complete recovery from an apoplectic attack is neither expected nor possible, but there are thousands of people today living happy and useful lives who, a quarter of a century ago, could never have hoped to lead a useful life again.

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Country practice

A veterinary surgeon working in a country practice deals mostly with large animals which are kept for commercial purposes. Dairy cows probably constitute the greatest part of his work, although some veterinary surgeons have riding stables, racing stables, and stud farms in their practices. These provide work with sick horses – the horses are sometimes very valuable.

Because farm animals are kept for the money which they can earn, the veterinary surgeons who treat them must always consider whether the financial value of his patient, when cured, is likely to be worth the cost of his skill and the necessary drugs. Farmers fortunate enough to own a prize bull would not object to paying £10 to have such a valuable animal brought back to full health, but they would think very hard before spending an equal amount on a sickly calf.

Taking a horse's pulse

Taking a cow's pulse

In the cowshed the veterinary surgeon is much concerned with the birth of calves. Usually this is an uneventful process which needs no human assistance, or a little help which an experienced cowman can give. But just occasionally there are difficulties which require the expert help which only a veterinary surgeon can provide. Other troubles of cows include *contagious abortion*, which causes undulant fever when passed on to humans in infected milk; *milk fever*, which occurs soon after calving; and an inflammatory condition of the udder called *mastitis*.

The smaller farm animals such as sheep and poultry are usually treated as flocks rather than as single animals. The reason for this is that the profit on each animal is less than the cost of a veterinary surgeon's visit, and so, if an animal falls ill, it is cheaper for the farmer to destroy it rather than to call in expert assistance. But if there appears to be an infectious or spreading illness in a flock, then the whole flock is at stake. As a whole its value is such that it is worth the cost of a veterinary surgeon's advice.

Intravenous injection in a horse

Intravenous injection in a dog and (below) in a pig

Town practice

The veterinary surgeon who chooses to work in a town has a very different kind of practice from that of his colleague in the country. To begin with almost all of his patients are likely to be small animals which are kept as pets instead of large animals kept for financial reward. Comparatively few of these small animal patients will have any monetary value, although almost all of them will have a sentimental value so great that their owners will be prepared to pay quite highly for the veterinary surgeon's advice and treatment.

An injection into a cat's peritoneal cavity

Much of the urban veterinary surgeon's work is concerned with the prevention of disease rather than with its treatment. Dogs, for example, suffer very commonly from the conditions known as *distemper* and *hardpad*, both of which are easily prevented by vaccination. Dogs are also vaccinated to protect them against *canicola fever*, a most unpleasant illness which is sometimes transmitted from dogs to humans. Cats, too, are frequently vaccinated, particularly against *feline enteritis*.

A carious tooth is extracted from a chimpanzee

In many veterinary practices two or more veterinary surgeons work together. An arrangement like this often means that each surgeon can specialise to some extent in the aspects of veterinary science which interest him most. It is, therefore, not unusual to find that one member of the team undertakes almost all of the consultations and visits while another does most of the surgical work.

Giving a baby coyote vitamins

Treating cats

Cats are usually the most frequent patients in the veterinary surgeon's operating room. Although kittens are delightful little creatures, few people wish to have their houses full of them; in order to prevent this most female cats are sterilised by an operation in which the uterus is removed. Male cats, too, are frequently sterilised, though in their case the purpose is to prevent the development of the scent glands beneath the tail which make tom cats smell so unpleasantly.

A splint is applied to a crane's broken leg

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Veterinary science *Cover*
Uganda, Tanganyika, and Zanzibar *2977*
The enemies of plants *2980*
Lloyd George *2982*
The Aryans *2984*

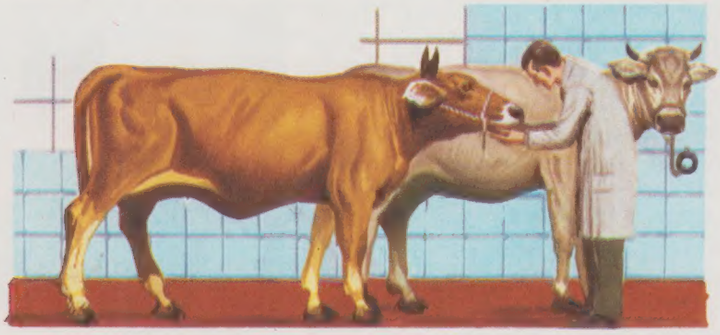
contents

Colonial expansion in the 19th century *2986*
Manatees and dugongs *2988*
History of U S S R (part two) *2990*
Apoplexy *2992*

contents

Veterinary surgeons in government service

In Britain a large number of veterinary surgeons work for the Ministry of Agriculture and Fisheries. Their task is not to



A veterinary surgeon examines a beast before it is killed for meat

care for individual animals but to supervise animal health in general. Their interests chiefly lie in infectious diseases, and they safeguard not only the farmers' herds and flocks but also the health of the people who consume the animal produce, since some diseases of animals are easily transmitted to humans.

Among the most important duties of the government veterinary surgeons are the diagnosis of outbreaks of foot and mouth disease (brought over from the Continent, possibly by birds), and the supervision of the steps taken to stop the spread of this disease. These include restriction of animal movement and rigid quarantines. In the same way they supervise the control of outbreaks of swine fever and of the intensely infectious disease of poultry called Newcastle Disease.

The greatest success achieved by the veterinary officers of the Ministry of Agriculture has, undoubtedly, been the eradication of tuberculosis in dairy cattle. At one time this disease was very common in dairy herds, and sometimes tubercle bacilli from the diseased animals found their way into the milk. This source of tuberculous infection in humans was greatly reduced by the introduction of pasteurisation. But the final solution lay in tuberculosis-free milking herds, which have been achieved by regular testing of dairy cattle.

Veterinary surgeons in industry

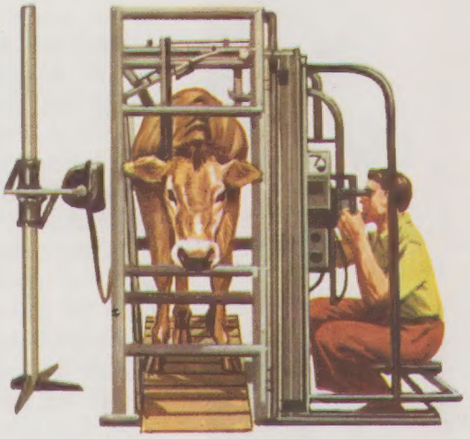
Some veterinary surgeons find an interesting outlet for their talents in industry, particularly in the pharmaceutical industry. Most large pharmaceutical firms are constantly devising new drugs for the prevention and treatment of disease in animals and they employ veterinary surgeons, especially those with a particularly scientific turn of mind, to test each product before it is marketed.

A rather different opportunity within industry lies in the advisory service which most pharmaceutical firms provide. A veterinary surgeon who is experienced in the use of all of a firm's products is employed to give free advice by telephone or letter to any veterinary surgeon who asks for it. He may also be responsible for writing advisory leaflets which the firm sends out to farmers.

Veterinary research

The training which veterinary surgeons receive is based on a very scientific approach to their vocation and, in consequence, many veterinary surgeons feel that veterinary research is more to their taste than general practice. They therefore seek research appointments.

In Britain such appointments are provided mostly by the Agricultural Research Council, the pharmaceutical industry, the universities (particularly those which have schools of veterinary science), and one or two commercial firms which are interested in the breeding of animals on a large scale. Rather unexpectedly, the Medical Research Council, too, has a number of veterinary surgeons on its staff.



An X-ray picture is taken of a cow

The problems undertaken by veterinary surgeons engaged on research are very varied. Some work on tasks such as the development, the manufacture, and the testing of vaccines. Others interest themselves in the problems of animal nutrition, a matter closely connected with the profitability of a farmer's herds. Yet others are concerned with genetics, the science which deals with the inheritance of parental characters. In these ways, and in many others, veterinary surgeons are continually trying to improve the health of domestic animals.

HOW A VETERINARY SURGEON IS TRAINED

In the British Isles there are schools of veterinary science in London, Cambridge, Liverpool, Edinburgh, Belfast, Bristol, and Dublin. In each city the school is part of the university, and the instruction of the students is undertaken by members of the university staff. The course lasts for five to seven years, and since it requires considerable intelligence and powers of memory only young people with good results in the General Certificate of Education at Advanced Level are accepted.

During the first half of the course the students study the normal anatomy and physiology of the common domestic animals. Only when they have completed this and have passed an examination in these subjects do they begin to study veterinary medicine, surgery, and obstetrics. At the end of the course the Final Examination, if passed, makes each student eligible for membership of the Royal College of Veterinary Surgeons.